

**July 10, 2000**

**Perchlorate in Fertilizers and Plants: Recent Research Results**  
**EPA, Office of Research and Development**

ORD scientists will present two papers related to perchlorate at the American Chemical Society Meeting in Washington, DC August 20 - 25, 2000. Abstracts of the papers will appear on the American Chemical Society's web site on Thursday, July 13. The papers are:

- (1) Accumulation of Perchlorate in Tobacco Plants and Tobacco Products  
by Dr. Lee Wolfe et al., and
- (2) Perchlorate in Fertilizers?: Analysis by Raman Spectroscopy  
by Dr. Timothy Collette and Ted Williams.

Brief summaries of the two research efforts are described below. In addition, we have prepared a "Summary of Perchlorate in Fertilizers and Plants" information sheet that describes EPA's and others' activities devoted to perchlorate.

**"Accumulation of Perchlorate in Tobacco Plants and Tobacco Products"**

Part of EPA's research to mitigate perchlorate contamination includes phytoremediation – the use of plants to degrade or take up contaminants. As part of this research, ORD scientists have investigated different kinds of plants and found that their activities vary. Preliminary studies in the laboratory and in the greenhouse have found that some plants break down perchlorate (directly or by spurring degradation by soil microbes), while others take up perchlorate and accumulate it for a period of time in their leaves, stems and roots.

Perchlorate uptake by tobacco plants in the 1999 growing season was investigated by analyzing samples of mature green tobacco leaf, flue-cured leaf, soil, and the applied fertilizers, including Bulldog Soda, a Chilean nitrate fertilizer that contains perchlorate as a natural impurity. Results show that perchlorate is accumulated by tobacco plants into the lamina and midrib of the leaves from soils amended with Bulldog Soda.

Perchlorate can also persist over an extended period of time and under a variety of industrial processes as shown by its presence in off-the-shelf tobacco products. ORD scientists analyzed five brands of chewing tobaccos, two cigarette brands and one brand of cigar purchased in November-December 1999. Using ion chromatography, perchlorate was detected in all but one of the other tobacco products at levels ranging from 0.4 mg/kg to 21.5 mg/kg. Both the lowest and highest levels were in chewing tobaccos.

**Perchlorate in Fertilizers?: Analysis by Raman Spectroscopy**

ORD scientists found perchlorate at high levels (about 500 - 8000 mg/kg) in over 90% of more than 25 fertilizers (primarily lawn-and-garden products) not identified as containing components known to contain perchlorate naturally (e.g., derived from mined Chilean saltpeter). These products were all acquired over the period of November 1998 to January 1999.

Subsequently, ORD scientists analyzed more than 20 fertilizer products, acquired between August 1999 and March 2000. Some of these were the same products (although not the same lots) as those previously sampled. Perchlorate was found in only 2 of these products - both hydroponic fertilizers - and at a lower level than measured before. Several more hydroponic fertilizers have been purchased to assess how widespread this situation may be.

As part of this research effort, a Raman spectroscopic method has been developed for both qualitative and quantitative analysis of perchlorate in fertilizers. This method has a detection level of approximately 20 ppm in aqueous extracts and will be useful in future perchlorate analyses.